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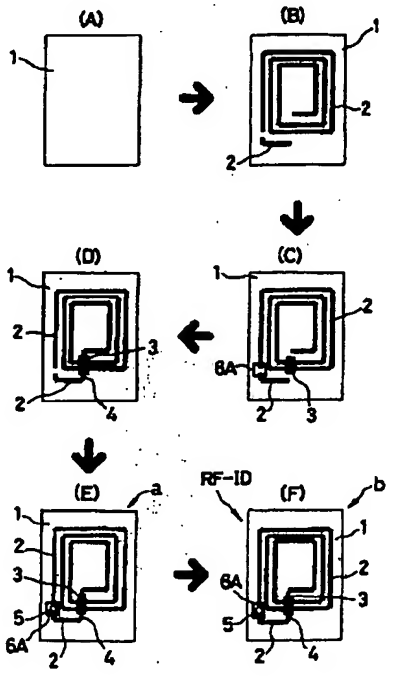
(54) **[Title of the invention]** IC media

(57) **[Summary]**

[Objective] To provide IC chip potting section that is able to do strong potting of IC chip with polymer member, and IC chip mounted media having an IC chip potting section.

[Means to solve] It is able to solve the problem with IC media wherein a protruding section comprising polymer member is formed to surround IC chip and height of said protruding section is 0.7 to 2 times of the height of said IC chip. It is desirable if an antenna section being mounted with an IC chip is provided and at least one layer of sheet is further laminated on the substrate wherein the protruding section composed with polymer member is formed to surround said IC chip.



[Patent claims]

[Claim 1] IC media being characterized that they are mounted with an IC chip on the surface of substrate, a protruding section composed with polymer member is formed around said IC chip, and height of said protruding part is 0.7 to 2.0 times of height of said IC chip.

[Claim 2] IC media being described in Claim 1 and characterized that at least one layer of sheet is further laminated to the surface of said substrate that comprises protruding section being composed with polymer member around an IC chip.

[Claim 3] IC media being described in Claim 1 or Claim 2 and characterized by being inlet sheets that are composed by further providing an antenna section on the surface of said substrate and an adhesive layer on its opposing surface, and have non-contact data sending and receiving function.

[Detail description of the invention]

[0001]

[Technology field this invention belongs] This invention concerns general IC media including, IC media having an IC chip that is protected in new form, which are, for examples, information recording media such as contact type, non-contact type or hybrid type IC card, label, tag and form, information recording component such as interposer and inlet sheet, and further such as IC boards being assembled into devices.

[0002]

[Prior technology] Previously, the form of protecting IC chips is to enclose entire IC chip with polymer member (potting agent), therefore, IC media constituted by having thus protected IC chip have been common. For example, the constitution of non-contact type IC media, is described here which is used for the applications of information recording media which is able to do such as recording and erasing of data by sending and receiving data in a condition of non-contact wherein the IC media are such as non-contact type IC card, tag and label. These IC media have a constitution having an antenna section comprising electro-conductive material being located on a substrate and an IC chip is mounted on the antenna section. For the antenna section of this non-contact type data sending and receiving unit, those which are printed and formed with electro-conductive paste, for example, and for the IC chip, those which are provided with connection terminals which are to connect by poking into the terminal section of the antenna section which is located at chip mounting position of the substrate, for example, have been adopted, respectively.

[0003] A process for producing non-contact type IC media is described by using Figure 6. Figure 7 is an explanation drawing for schematically explain the cross section of non-contact IC media being produced in Figure 6. Substrate 1 is prepared in process (A). Antenna section 2 having a pattern that is shown in the drawing is formed on specific location of surface of the substrate 1 in process (B) by a method such as screen printing using electro-conductive paste and curing/drying. Insulation section 3 that is shown in the drawing is formed in process (C) by a method such as printing on specific location of the antenna section 2 using insulation paste then curing/drying. A jumper section 4 is formed in process (D) after forming the insulation section 3 by a method such as a method such as screen printing using electro-conductive paste and curing/drying, to connect between two antenna sections in the drawing by making it conductive. An IC chip 5 is mounted in process (E) by a method such as poking connection terminals 7 of the IC chip 5 between the antenna section 2 that is located at the chip mounting position being shown in the drawing of the substrate 1, to make conductive. Non-contact IC media is formed in process (F) by covering the mounted IC chip 5 by potting method with thermoset

insulation paste comprising polymer member 6 of such as phenolic resin and polyester resin then hardening it to seal the IC chip 5.

[0004]

[Problems that the invention is to solve] Thus formed IC media have bending resistance and superior in reliability because IC chip 5 is protected so that entire IC chip is enclosed with polymer member (potting material) 6 with potting method, however, bulging up of polymer member is very high compared to the height of the IC chip because it encloses entire IC chip as the cross section is schematically shown in Figure 7, and as a result, this mound part is prone to contact with other objects and there has been a danger of delamination of IC chip due to this. Also, there have been a problem that a sheet that is forced to laminate is partially broken by bulging polymer member 6 when laminating a sheet over this IC media, for example when producing a non-contact type IC card. Where, if the polymer member 6 were not used, there will be no case that laminated sheet is broken with the polymer member 6 at making it into a card, however, there are problems that it is inferior in mending resistance and also inferior in resistance against pressure force from the top.

[0005] The objective of this invention is to provide highly reliable IC media wherein there is no bulging up of the polymer member that protects IC chip to make it hard to contact with other objects and to eliminate delamination of IC chip due to this, there is no occurrence of such as partial sheet breakage even when a sheet is laminated, and further it is superior in bending resistance and resistance against pressure force from the top; and furthermore to provide an inlet sheet having non-contact type data sending and receiving function wherein an antenna section is provided on surface of the substrate, as the most favorable IC media of this invention.

[0006]

[Means to solve the problems] In order to solve above objectives, the IC media of Claim 1 of this invention are characterized that they are mounted with an IC chip on the surface of substrate, a protruding section composed with polymer member is formed around said IC chip, and height of said protruding part is 0.7 to 2.0 times of height of said IC chip.

[0007] The IC media of Claim 2 of this invention are characterized that at least one layer of sheet is further laminated to the surface of said substrate that comprises protruding section being composed with polymer member around an IC chip.

[0008] The IC media of Claim 3 of this invention are characterized by being inlet sheets that are composed by further providing an antenna section on the surface of said substrate and an adhesive layer on its opposing surface, and have non-contact data sending and receiving function, in the IC media being described in Claim 1 or Claim 2.

[0009] As described, the IC media of this invention are able to well protect IC chip because a protruding section which comprises polymer member and of which height is made to be 0.7 to 2 times of height of the IC chip is provided around the IC chip, and at the same time, it is able to set the height of polymer member lower compared to previous ones enclosing entire IC chip, and as a result, the polymer member hardly contact with other objects and there is no delamination of the IC chip due to this, partial breakage of sheet does not occur even when a sheet is laminated, and further, it is excellent in bending resistance and resistance against pressure force from the top.

[0010]

[Form of embodiment of the invention] Embodiment form of the IC media of this invention is described below in detail by showing an inlet sheet as the example. Production process of non-contact type an IC medium (inlet sheet) which is an embodiment form of this invention is described by using Figure 1. Figure 2 (a) is an explanation

drawing that schematically describes cross section of an IC medium (inlet sheet) being produced in Figure 1, and (b) is its plan view explanation drawing. Substrate 1 is prepared in process (A). Antenna section 2 having a pattern that is shown in the drawing is formed on specific location of surface of the substrate 1 in process (B) by a method such as screen printing using electro-conductive paste and curing/drying. Insulation section 3 and protruding section 6A which are show in the drawing are formed in process (C) by a method such as printing the insulation section 3 that is shown in the drawing and printing to form the protruding section 6A around the IC chip 5 that is to be mounted in below described process (E), by using thermally curable insulation paste comprising polymer member 6 of such as phenolic resin or polyester resin on specific location of the antenna section 2, then curing/drying. After forming the insulation section 3 and protruding section 6A, a jumper section 4 is formed over this insulation section 3 by a method such as screen printing using electro-conductive paste and curing/drying, and connected by making it conductive between two antenna sections 2 in the drawing in process (D). In process (E), a non-contact IC medium a is formed by mounting an IC chip 5 by a method such as inserting connecting terminals 7 of the IC chip 5 to be conductive between antenna sections 2 which are located at the chip mounting location of substrate 1 being surrounded by the protruding section 6A. In process (F), inlet sheet b (namely, a non-contact IC media wherein antenna section 2 and further adhesive layer 8 are provided on a surface of the substrate 1 and on other surface, respectively) is formed by providing an adhesive layer 8 by coating adhesive on back side of the substrate 1 of this formed non-contact IC media.

[0011] Thus produced non-contact IC medium (inlet sheet) is formed with protruding section 6A comprising polymer member around the IC chip 5, and height h of the protruding section 6A is about 1.5 times of the height t of the IC chip 5 as shown in Figure 2 (a). At this level, a sheet will not be destroyed by the protruding section 6A when at least one layer of sheet is laminated over it, and the IC chip 5 is protected with the protruding section 6A, therefore, it is excellent in resistance against bending and resistance against pressure force from the top without such as breakage of the IC chip 5, thus it is excellent in reliability.

[0012] This invention specifies the height h of the protruded section 6A to be 0.7 to 2 times of height t of the IC chip 5, and this is because the IC chip 5 is not well protected with the protruding section 6A and inferior in bending resistance and resistance against pressure fore from the top to cause inferior reliability if height of the protruding section 6A is less than 0.7 times of the height t of the IC chip 5. On the other hand, if height h of the protruding section 6A is made to be high exceeding 2 times of the height t of the IC chip 5, the polymer member is prone to contact with other objects when it is not laminated and danger of delamination of the IC chip is increased, and when a sheet is further laminated, there is a danger that the sheet is partially destroyed with the protruding section 6A. Preferably, the height h of the protruding section 6A is sufficient with 20 to 60 % taller than the height t of the IC chip 5.

[0013] In above example, an example was shown wherein the protruding section 6A was formed in continuous square shape around the IC chip 5, however, the shape shall not be restricted within square shape and it may be circular shape, triangular shape, polygonal shape, or mass of dots in undefined shapes.

[0014] Further, the protruding section 6A may not be formed continuously as far at it is formed around the IC chip 5, and it may be formed in discontinuously by forming in uniform distance, non-uniform distance or

combination of those. If it is discontinuously formed, electro-conductive materials such as electro-conductive paste may be used for the polymer member that forms the protruding section 6A, although it is desirable to use insulating material such as insulation paste.

[0015] Figure 3 is an explanation drawing that explains such as the shape of the protruding section. (a) shows an example which is formed in continuous circular shape around the IC chip 5, (b) shows an example which is formed in discontinuous square shape around the IC chip 5, and (c) shows an example which is formed in discontinuous circular shape around the IC chip 5.

[0016] In above examples, examples forming the protruding section 6A along with the insulation section 3 by using such as insulation paste in (C) process, however, the process for forming the protruding section 6A shall not be restricted within this and it may be formed in either (B) process, (D) process or (E) process before mounting an IC chip 5, and also it may be formed in (E) process or (F) process which are after mounting the IC chip.

[0017] The forming method of the protruding section 6A shall not be restricted in specific, and known methods such as printing method (such as screen printing method or metal masking method, for examples), dispense method, spray method may be used. Potting of the IC chip 5 is normally conducted after mounting the IC chip, and it is able to form the protruding section 6A after mounting the IC chip in this invention, however, it is able to form the protruding section 6A before mounting the IC chip as described above. Also, it does not matter if topping foil is mounted or such as seal is applied on it after forming the protruding section 6A.

[0018] Figure 4 is an explanation drawing explaining cross section of non-contact type IC card which is formed by using inlet sheet b, and Figure 5 is a plan view explanation drawing of the non-contact type IC card. As shown in Figure 4, the non-contact type IC card 20 is laminated with an over sheet material (PVC resin) 9 to the bottom surface of inlet sheet b with adhesive layer 8 and an over sheet material (PVC resin) 11 is laminated to the top surface of the inlet sheet b with adhesive layer 10, and as shown in Figure 5, a company logo 25, necessary printed characters 26 are formed at specific location of on the top surface of the over sheet material (PVC resin) 11.

[0019] Either insulation material such as insulation paste or conductive material such as conductive paste may be used for the polymer member that forms the protruding section 6A. However, use of insulating material such as insulating paste is desirable. As the concrete polymer materials it is able to mention thermally curable or radiation curable hardening resins such as acrylate compounds, methacrylate compounds, propenyl compounds, aryl compounds, vinyl compounds, acetylene compounds, unsaturated polyesters, epoxy-poly-(meth)acrylates, poly-(meth(acrylate polyurethanes, polyester polyol poly(meth)acrylates, polyether polyol poly(meth)acrylates, phenoxy ethyl (meth)acrylates, tetra-hydro-furfuryl (meth)acrylate, styrene, α-alkyl styrene, and other epoxy compounds, for examples. These may be used by mixing two or more kinds.

[0020] It is able to add such as liquid poly-butene, mineral oil, liquid poly-isobutylene, liquid poly-acrylates, tackifier, rosin and rosin derivatives, poly-terpene resin, terpene phenolic resin, and petroleum resin. Also, it is able to dilute with organic solvent as necessary.

[0021] Further, it is able to formulate fillers as needed. As the fillers, it is able to mention such as silica, alumina, calcium carbonate, titanium oxide, and carbon black, for examples. These may be used by mixing two or more kinds. Formulating amount of the

filler shall not be restricted in specific, however, it is desirable to set at 30 to 85 weight percent to the total of the resin compound.

[0022] The epoxy compound that is used in this invention is not restricted in specific as long as it is an epoxy compound having 2 ore more epoxy groups in one molecule and hardened to be resin state, and epoxy compounds which have been known to the public may be used. As concrete examples of epoxy compounds, it is able to mention such as bis-phenol A type epoxy compounds, bis-phenol F type epoxy compounds, tetra-bromo-bis-phenol A type epoxy compounds, phenol-novolac type epoxy compounds, cresol-novolac type epoxy compounds, glycidyl ester type epoxy compounds, alicyclic epoxy compounds, hydantoin epoxy compounds, and mixtures of 2 or more kinds of these, for examples.

[0023] In this invention, reactive thinner may be added to the epoxy compounds. As the reactive thinner, epoxy compounds which have one or two or more of epoxy groups in one molecule and are relatively in low viscosity at room temperature are able to be preferably used and they may have other polymerizing functional groups other than the epoxy groups, such as alkenyl groups such as vinyl group and aryl group, and unsaturated carboxylic groups such as (meth)acryloyl groups, for example, according to the purposes.

[0024] As the hardeners that is used in this invention, such as phenolic resins, acid anhydrates, and amine type compounds may be used. As the phenolic resins, such as phenol novolac resin, cresol novolac resin, naphtol modified phenolic resin, di-cyclo-pentadiene modified phenolic resin and paraxylene modified phenolic resin are mentioned as examples, however, it shall not be restricted within those.

[0025] Formulated amount of the epoxy compound and phenolic resin which is a hardener is desired that OH equivalent in the phenolic resin is 0.3 to 1.5 equivalent to 1 equivalent of epoxy group in the epoxy compound, and 0.5 to 1.2 equivalent is more desirable.

[0026] As the acid anhydride, such as methyl-tetra-hydro-phthalic acid anhydride, methyl-hexa-hydro-phthalic acid anhydride, alkylated tetra-hydro-phthalic acid anhydride, hexa-hydro-phthalic acid anhydride, methyl-himic acid anhydride, and dodecenyl succinic acid are mentioned as examples.

[0027] Formulated ratio of the epoxy compound and acid anhydride is desired that acid anhydride equivalent is 0.6 to 1.0 to 1 equivalent of epoxy group in epoxy compound.

[0028] As the amine compounds, modified poly-amine such as aliphatic poly-amine, aromatic poly-amine, poly-amino-amide, poly-amino-imide, poly-amino-ester and poly-amino-urea are mentioned as examples, however, they shall not be restricted within those. It is able to use compounds of tertiary amine type, imidazole type, hydrazide type, di-cyano-di-amide type and melamine type.

[0029] Formulated ratio of the epoxy compound and amine compound is desired that amine equivalent is 0.6 to 1.0 to 1 equivalent of epoxy group in epoxy compound.

[0030] It is able to formulate flexibility adding agent as needed to the polymer member that is used in this invention. As the flexibility adding agents, it is able to concretely mention polyester type flexibility adding agents, acrylic type flexibility adding agents, urethane type flexibility adding agents, polyvinyl acetate type flexibility adding agents, thermoplastic elastomer type flexibility adding agents, natural rubber type flexibility adding agents, synthetic rubber type flexibility adding agents, and mixture of two or more kinds of those, as examples. Any of these may be used, however, polyester polyol, polyvinyl alkyl ether and mixture of

two or more kinds of those are preferably used because their effect is significant.

[0031] Formulated amount of the flexibility adding agent in the polymer member is not restricted in specific as long as within a range which improves adhesion strength or adds flexibility and elasticity, although it depends on the type of flexibility adding agent, however, it is desirable to set within a range of 30 to 70 weight percent to the total of the polymer member. Under 30 weight percent, flexibility and elasticity may not be able to add, and over 70 %, adhesion strength may be reduced.

[0032] In this invention, curing promoter may be formulated in order to promote hardening. As the curing promoter, it shall not be restricted in specific but it is able to concretely mention those which have been used as curing promoter for epoxy compound such as imidazole type, tertiary amine type and phosphorous compounds, as examples, and they may be selectively used depending on the objective of use and required curing conditions. These may be used alone or two or more kinds may be used together. Formulating amount of the curing promoter is desired to be set at 0.5 to 2.0 weight percent to the total of the polymer member.

[0033] In this invention, filler may be further formulated to the polymer member. As the fillers, it is able to mention inorganic fine particles, organic fine particles and mixtures of both.

[0034] As concrete examples of the inorganic fine particles it is able to mention such as Mizukasil* P-526, P-801, P-527, P-603, P832, P-73, P-78A, P-78F, P-87, P-705, P-707, P-707D (made by Misusawa Kagaku Co.), Nipsil E200, E220, SS-10F, SS-15, SS-50 (made by Nippon Silica Kogyo Co.), SYLYSIA730, 310 (made by Fuji Sylysia Kagaku Co.) as silica fine particles; such as Brilliant-S15, Unibur-70, PZ, PX, Tunex* E, Vigot-10, Vigoto-15, Unifant-15FR, Brilliant-1500, Homocal* D, Gelton* 50 (made by Shiraishi Kogyo Co.) as calcium carbonate fine particles; Chisan* White SW, SW-B, SW-BL (made by Shiraishi Kogyo Co.) as sulfo-calcium alminate fine particles; such as AL-41G, AL-41, AL-42, AL-43, AL-44, AL-41E, AL-42E, AL-M41, AL-M42, AL-M43, AL-M44, AL-S43, AM-21, AM-22, AM-25, AM-27 (made by Sumitomo Chemical Co.), Aluminum Oxide C (made by Nihon Aerosil Co.) as alumina fine particles; and Titanium Dioxide T805, P25 (made by Nihon Aerosil Co.) as titanium dioxide fine particles, as examples.

**Translator's note: These are phonetical translation of Japanese brand names and original English spellings are not known.*

[0035] As concrete examples of the organic fine particles it is able to mention such as tetra-fluoro-ethylene resin (Teflon (registered trademark) 30J, Mitsui Dupont Fluorochemical Co.), hexa-fluoro-vinylidene resin (Neoflon* CTFE, Daikin Kogyo Co.), tri-fluoro-chloro-ethylene resin (Neoflon* VDF, Daikin Kogyo Co.), hexa-fluoro-propylene resin (Neoflon* FEP, Daikin Kogyo Co.), ethylene-fluoride-propylene copolymer (Teflon (registered trademark) 120J, Mitsui Dupont Fluorochemical Co.), various starch fine particles, acrylic resin fine particles and methacrylic resin fine particles, as examples. These particles may be used alone or used as a combination of 2 or more kinds.

[0036] Formulated amount of the fillers shall not be restricted within specific, however, a range of 30 to 85 weight percent to the total of the polymer member is preferably desirable.

[0037] In this invention, it may be able to further add such as solvent, anti-burning agent such as bromine compound or phosphorous compound, silicone type polymer and anti-foaming agent containing it, carbon black, coloring agent such as organic pigments, coupling agent, tackifier, thixotropy agent, anti-sedimentation agent, anti-oxidation agent

and dispersing agent, as required, to the polymer member. Added amount of those is desired to be 35 weight percent or less to the total of the polymer member.

[0038] The polymer member that is used in this invention is produced, for example, by uniformly mixing above described components with an mixer such as homogenizer, then further uniformly dispersing with a kneading machine such as kneader, however, the production process shall not be limited with this method.

[0039] As the substrate being used in this invention it is able to select and use from substrates which are known to the public, such as ceramics, glass; fabric, nonwoven fabric mat, paper of inorganic fibers such as glass fiber and alumina fiber, or organic fibers such as polyester fiber and polyamide fiber, and composite materials of those and thermoset resin or thermoplastic resin; plastics being represented by such as polyethylene, polypropylene, poly-ethylene-terephthalate, polyimide, acrylonitrile-butadiene-styrene copolymer, polyvinylchloride and silicone; and also, plastic substrates such as polyamide type resin substrate, ethylene-vinyl-alcohol copolymer resin substrate, poly-vinyl-alcohol type resin substrate, poly-vinylidene-chloride type resin substrate, polystyrene type resin substrate, polycarbonate type resin substrate, and polyether-sulfone type resin substrate; or those which are applied with surface treatments such as matte treatment, corona discharge treatment, plasma treatment, ultraviolet irradiation treatment, electron beam irradiation treatment, flame plasma treatment and ozone treatment, or various primer treatment, to these.

[0040] For the IC chips being used in this invention, those which are known to the public may be arbitrarily used.

[0041] Further, in the case that this invention is non-contact IC media, the pattern of antenna section 2 may be arbitrarily set corresponding to it. For securely connect and fix the IC chip 5 and antenna section 2, wire bonding or thermoset adhesives which are known to the public are used, and as the thermoset adhesives in concrete, it is able to use such as anisotropic electro-conductive adhesive materials such as ACF (Anisotropic Conductive Film) and ACP (Anisotropic Conductive Paste), or able to use such as insulation adhesive materials (adhesive materials which do not contain conductive material) such as NCF (Non-Conductive Film), NCP (Non-Conductive Paste) or double sticky tape in recent years, and it is able to use such as dispensing method, printing method and spraying method for application. Among those, it is desired to use ACP or NCP and apply with dispensing method or printing method.

[0042] Bump 7 may be formed as needed on connecting terminals of IC chip 5 to be used in this invention by such as metal electrolysis plating, stud, electroless metal plating or fixing of electro-conductive resin.

[0043] When mounting the IC chip 5, pressure as needed and energy such as heat, light, electromagnetic wave such as radio wave or ultrasonic sound according to adhesive, may be applied.

[0044] Further, post curing may be done after mounting the IC chip 5 in order to make fixing sufficient.

[0045] Where, above described explanation of embodiment is for explaining this invention and it does not restrict the invention that is described in the Claims, or does not reduce the range. Also, constitution of each part of this invention is not restricted within said form of embodiment and various variations are available within a technical range that is described in the Claims.

[0046]

[Embodiment examples] This invention is further described below with embodiment examples and control examples, however, this invention shall not be restricted with these

embodiment examples at all.

[0047] (Embodiment example 1) Using Ohmcoat XR1012-168B (made by Namics Co., Ltd.) as polymer member (heating condition: 30 minutes curing at 150 °C), an inlet sheet b was made following the process being shown by Figure 1 (A) through (F), then a non-contact type IC card 20 having cross sectional structure that is shown in Figure 2 (a) was produced using the inlet sheet b. It was; t (IC chip 5 height) = 200 μm, h (height of protruding section 6A) = 350 μm. It was able to easily laminate an over sheet material 11 (polyvinyl chloride resin) on the top surface of the inlet sheet b.

Bending resistance test: Bending resistance was evaluated by wrapping the inlet sheet around stainless steel rods in various diameters then conducting read/write test. The diameter of smallest stainless steel rod that did not loose communication was measured and the bending resistance was described with this diameter.

Pressure resistance: A non-contact type IC card was placed on a horizontal table and pressure was applied from the top with a pressure rod that has slightly larger diameter than the IC chip and protruding section, and the force (N: Newton) until the communication was lost was measured.

Results of the test were; bending resistance 20 mm and pressure resistance 50 N or more, which means that it was excellent in bending resistance and pressure resistance.

[0048] (Embodiment example 2) An inlet sheet b and a non-contact type IC card 20 were produced as same as Embodiment example 1 except for making the shape of protruding section 6A to be round shape and h (height of protruding section 6) = 200 μm, and bending resistance test and pressure resistance test were done. It was able to easily laminate an over sheet material 11 (polyvinyl chloride resin) on the top surface of the inlet sheet b. Results of the test were; bending resistance 25 mm and pressure resistance 45 N or more, which means that it was excellent in bending resistance and pressure resistance.

[0049] (Embodiment example 3) An inlet sheet b and a non-contact type IC card 20 were produced as same as Embodiment example 1 except for making the shape of protruding section 6A to be round shape, and bending resistance test and pressure resistance test were done. It was able to easily laminate an over sheet material 11 (polyvinyl chloride resin) on the top surface of the inlet sheet b. Results of the test were; bending resistance 20 mm and pressure resistance 75 N or more, which means that it was excellent in bending resistance and pressure resistance.

[0050] (Embodiment example 4) An inlet sheet b and a non-contact type IC card 20 were produced as same as Embodiment example 1 except for using CRP-X432 (made by Sumitomo Bakelite Co., Ltd.) as the polymer member and making the shape of protruding section 6A to be round shape and h (height of protruding section 6) = 200 μm, and bending resistance test and pressure resistance test were done. It was able to easily laminate an over sheet material 11 (polyvinyl chloride resin) on the top surface of the inlet sheet b. Results of the test were; bending resistance 25 mm and pressure resistance 50 N or more, which means that it was excellent in bending resistance and pressure resistance.

[0051] (Embodiment example 5) An inlet sheet b and a non-contact type IC card 20 were produced as same as Embodiment example 1 except for using CRP-X432 (made by Sumitomo Bakelite Co., Ltd.) as the polymer member and making the shape of protruding section 6A to be round shape and h (height of protruding section 6) = 350 μm, and bending resistance test and pressure resistance test were done. It was able to easily laminate an over sheet material 11 (polyvinyl chloride resin) on the top surface of the inlet sheet b. Results of the test were;

bending resistance 20 mm and pressure resistance 80 N or more, which means that it was excellent in bending resistance and pressure resistance.

[0052] (Control example 1) An inlet sheet b and a non-contact type IC card 20 were produced for comparison as same as Embodiment example 1 except for not making the protruding section 6A, and bending resistance test and pressure resistance test were done. It was able to easily laminate an over sheet material 11 (polyvinyl chloride resin) on the top surface of the inlet sheet b. Results of the test were; bending resistance 30 mm and pressure resistance 25 N or more, which means that it was inferior in bending resistance and pressure resistance.

[0053] (Control example 2) An inlet sheet b was produced for comparison as same as Embodiment example 1 except for making a polymer member 6 (height of polymer member = 500 μm) that is shown in Figures 6 and 7 using the same polymer member with Embodiment example 1, and bending resistance test was done. Over sheet material 11 (polyvinyl chloride resin) was destroyed and it was not able to laminate an over sheet material 11 (polyvinyl chloride resin) on the top surface of the inlet sheet b, therefore, a non-contact type IC card was not able to be made, thus pressure resistance test was not able to be done. Result of the test was; bending resistance 15 mm, which means that it was excellent in bending resistance.

[0054]

[Effect of the invention] The IC media of Claim 1 of this invention shows significant effect that it is able to well protect the IC chip, and at the same time it allows to set the height of polymer member lower compared to previous ones which enclose entire IC chip, and as a result, the polymer member is hard to contact with other objects and there is no delamination of the IC chip accompanied with this, and further, it is excellent in bending resistance and resistance against pressure force from the top; because a protruding section composed with polymer member is formed around the IC chip and height of said protruding section is 0.7 to 2 times of said IC chip.

[0055] The IC media of Claim 2 of this invention shows further effect that such as partial breakage of the sheet does not occur and they are especially useful as such as contact type, non-contact type or hybrid type IC card or IC label, in addition to that they show the same effect of the IC media being described in Claim 1, because at least one layer of sheet is further laminated on the surface of said substrate where the protruding section being composed with polymer member around the IC chip, in the IC media being described in Claim 1 of this invention.

[0056] The IC media of Claim 3 of this invention shows further effect that they are easily usable for non-contact data sending and receiving by laminating, adhering or applying to other objects via adhesive layer, in addition to that they show the same effect of the IC media being described in Claim 1, because they are made by further providing antenna section on said substrate surface and adhesive layer on the other surface, and are inlet sheets having non-contact data sending and receiving function, in the IC media being described in Claim 1 or Claim 2 of this invention.

[Brief explanation of the drawings]

[Figure 1] (A) through (F) are explanation drawings of production process of a non-contact type IC medium (inlet sheet) which is a form of embodiment of this invention.

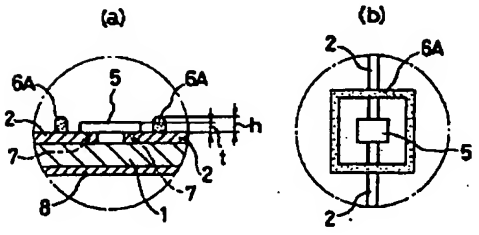
[Figure 2] (a) is an explanation drawing that explains cross section of the non-contact type IC medium (inlet sheet) that was produced in Figure 1, and (b) is its plan view explanation drawing.

[Figure 3] (a) through (c) are explanation drawings explaining such as shape of protruding section.

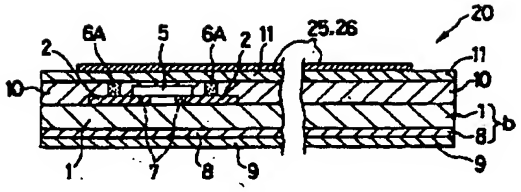
[Figure 4] An explanation drawing that explains a cross section of a non-contact type IC card.
[Figure 5] A plan view explanation drawing of the non-contact type IC card that is shown in Figure 4.
[Figure 6] (A) through (F) are explanation drawings of production process of previous non-contact type IC media.
[Figure 7] An explanation drawing explaining a cross section of a non-contact type IC media that was produced in Figure 6.
[Explanation of numbers]
1: substrate
2: antenna section
3: insulator section
4: jumper section
5: IC chip
6: polymer member
6A: protruding section
8: adhesive layer
a: non-contact type IC media
b: inlet sheet
h: height of protruding section
t: height of IC chip

Translated by Hideyo Sugimura, 651-490-0233, hsugimura@pipeline.com, November 25, 2003

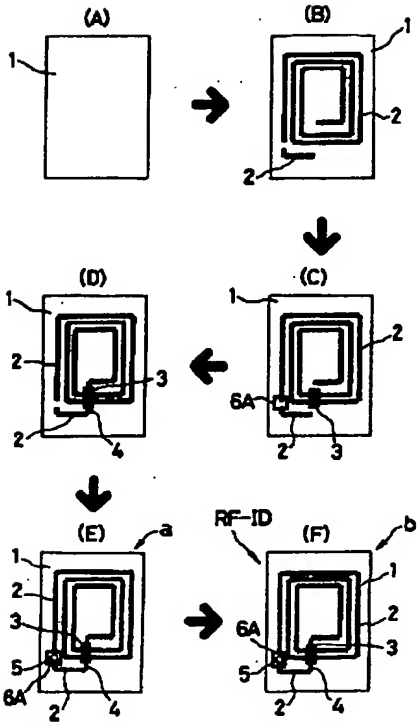
[Figure 2]



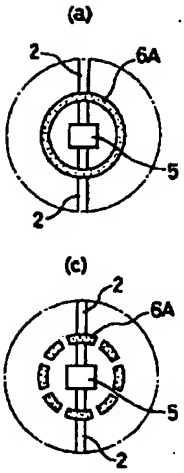
[Figure 4]



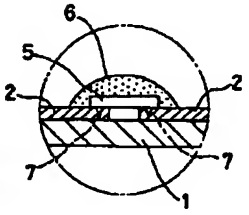
[Figure 1]



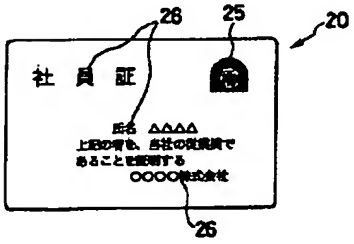
[Figure 3]



[Figure 7]



[Figure 5]



[Figure 6]